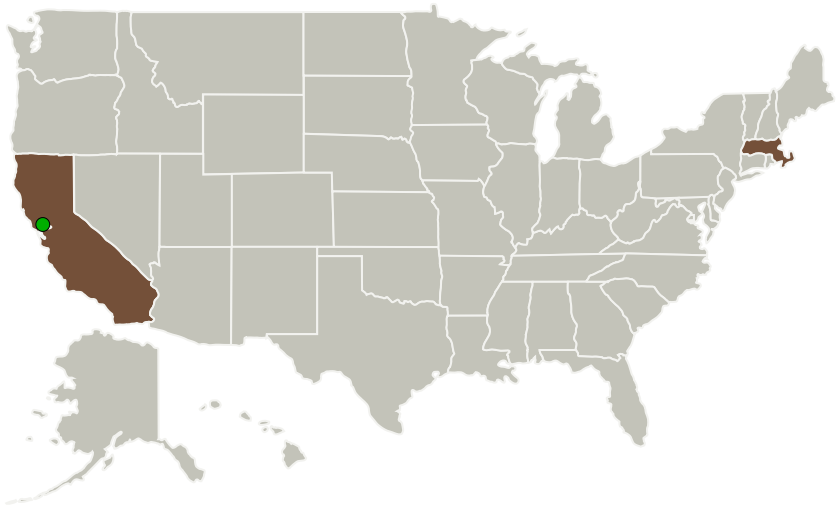
Reaction Wheel with Embedded MEMS IMU, Phase II

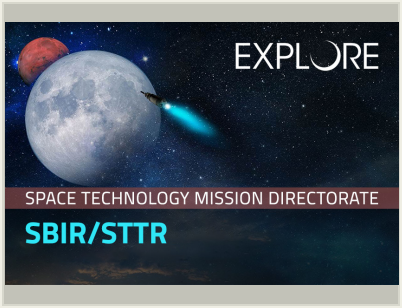
Completed Technology Project (2011 - 2013)

Project Introduction

Reaction wheels are used to stabilize satellites and to slew their orientation from object to object with precision and accuracy by varying the rotational speed of the wheels. Three or four wheels are usually used with three of them aligned along orthogonal axes. The degree to which pointing stability is achieved depends on the stability of the wheels' angular momentum vectors while spinning, which can be affected by static and dynamic unbalance contributions and other wheel construction issues. With the smaller satellites, requiring smaller wheels, the stability of the wheels will be even more challenging as the uncertainty of construction is likely to remain the same. To stabilize the smaller reaction wheels we propose to integrate a Sensor Chip containing MEMS gyroscopes and accelerometers with each reaction wheel. This allows direct measurement of the wheel motions for fine-tuning its operation. The improved wheel then becomes a means for improving IMU sensor stability for precision pointing and slewing from object to object.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Milli Sensor Systems and Actuators, Inc.	Lead Organization	Industry	West Newton, Massachusetts
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

June 2011: Project Start

May 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139266)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Milli Sensor Systems and Actuators, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

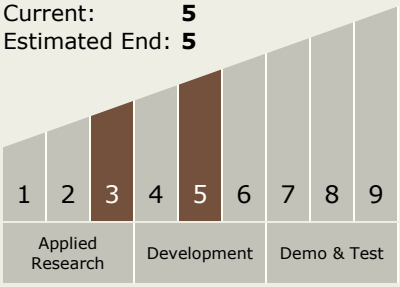
Carlos Torrez

Principal Investigator:

Donato (dan) Cardarelli

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.2 Reasoning and Acting
    - TX10.2.6 Fault Response

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System